

A Glossary of Terms Related to Radiation Dose

- DOSE:** Technically, a measure of the energy deposited in material by ionizing radiation. The traditional unit of dose is the “rad” which is equivalent to 100 ergs of energy deposited per gram of material.
- DOSE EQUIVALENT:** A measure of the biological effect (related to risk of cancer or leukemia) of a given DOSE of radiation. All regulatory limits are set in terms of DOSE EQUIVALENT. The traditional unit of DOSE EQUIVALENT is the “rem”. A more useful unit is the “millirem” which is 1/1000th of a rem. For example a typical chest X-ray gives a DOSE EQUIVALENT of from 10 to 20 millirem to the torso.
- DOSE RATE:** The rate at which DOSE (or DOSE EQUIVALENT) is received. Typically expressed in terms of “millirem per hour”. Often used as a measure of the intensity of a RADIATION field. for example “the DOSE RATE at one meter from that X-ray machine is 5,000 millirem per hour. If you stood in this RADIATION field for 2 hours, you would receive a total DOSE of 10,000 millirem.”
- BACKGROUND RADIATION:** Sources of radiation exposure which are naturally occurring, such as cosmic rays, RADON decay products in the air, uranium in rocks and soils, and potassium - 40 in our bodies.
- RADON:** RADON is an odorless, colorless radioactive gas which is a product of the RADIOACTIVE DECAY of uranium-238. RADON itself undergoes RADIOACTIVE DECAY, and these RADON decay products (which are also RADIOACTIVE) can be inhaled, resulting in an INTERNAL DOSE to the lungs.
- INTERNAL CONTAMINATION:** RADIONUCLIDES or RADIOACTIVE materials taken inside the body via inhalation, ingestion, or through wounds.
- INTERNAL DOSE:** A DOSE, or DOSE-EQUIVALENT, received from radioactive materials deposited inside the body.

COMMITTED DOSE EQUIVALENT: RADIONUCLIDES deposited inside the body may take weeks, months, or years to be totally eliminated from the body. During this time, the body is being irradiated. The COMMITTED DOSE EQUIVALENT is the total DOSE EQUIVALENT received over a period of time, typically 50 years.

RADIOACTIVITY: The spontaneous emission of RADIATION, from an unstable nucleus. Atoms which exhibit this behavior are called "RADIOACTIVE". The traditional unit of RADIOACTIVITY is called the "Curie" which is equivalent to 37,000,000,000 atoms undergoing RADIOACTIVE DECAY every second. (This is a very large quantity of activity. A more useful unit is the "microcurie" (μCi).)

RADIOACTIVE: Having the property of undergoing RADIOACTIVE DECAY and emitting RADIATION. There are varying degrees of being RADIOACTIVE, depending upon the quantity of RADIOACTIVE material, and the HALFLIFE of the particular RADIONUCLIDE.

RADIOACTIVE DECAY: The process by which an unstable atom gets rid of excess energy (in the form of RADIATION) and becomes less unstable. This decay process typically involves some re-arrangement of the nucleus of the atom.

RADIONUCLIDE: A RADIOACTIVE atom (or atoms) with a particular combination of neutrons and protons which uniquely define the characteristics of that atom. For example, uranium-238 (or "U-238") has 92 protons and 146 neutrons.

ISOTOPE: Similar to RADIONUCLIDE, but refers to atoms of the same element which have the same number of protons, but a different number of neutrons. For example, uranium-235 (92 protons + 143 neutrons) and uranium-238 (92 protons + 146 neutrons) are both RADIOACTIVE ISOTOPES of the element uranium. Their chemical properties are identical, but their nuclear properties are very different.

HALFLIFE: The time required for one-half of the atoms present of a particular RADIONUCLIDE to decay. Every RADIONUCLIDE has a different HALFLIFE, ranging from fractions of seconds to billions of years. As an example, if we start with 100 atoms of a radionuclide with a 5 year halflife, in 5 years only 50 atoms will be left, and in another 5 years, only half of those atoms (25 atoms) will be left.

RADIATION: The particles or packets of energy (photons) emitted by RADIOACTIVE (Ionizing) atoms as they undergo RADIOACTIVE DECAY or transformation. RADIATION which has sufficient energy to strip electrons away from atoms is called "ionizing" RADIATION.

NON-IONIZING RADIATION: Electromagnetic radiation which does not have sufficient energy to ionize atoms. Microwaves, ultra-violet radiation, and visible light all fall into this category.

CONTAMINATION: Typically used to refer to materials (e.g. dust) which have become contaminated (mixed with) RADIOACTIVE materials.